

REMARKS

Claims 1-15 are pending in this application, of which claims 9-15 have been withdrawn from consideration. Reconsideration of the rejections in view of these amendments and the following remarks is respectfully requested.

Specification

The Examiner has required a new title.

The title has been amended to read “Three Dimensional Semiconductor Integrated Circuit Device Having a Piercing Electrode.”

Rejections under 35 USC §102(b) and §103(a)

Claims 1, 4, 5 and 8 stand rejected under 35 U.S.C. §102(b) as being anticipated by Ochiai et al (JP 05-152529).

Applicant respectfully traverses this rejection.

Claims 1 and 5 have been amended to recite “wherein the piercing hole is formed by using the insulating film as an etching mask,” and “an insulating film sleeve lies only between the piercing electrode and an inside wall of the piercing hole in the semiconductor substrate.”

As described at page 10, line 29 - page 11, line 35 of the present application, the silicon substrate 41 is etched at the opening part 43C by reactive ion etching (RIE) method. A sulfur fluoride gas and a hydrocarbon gas are used reciprocally in the RIE method. As a result, a concave part 41C is formed in

the silicon substrate 41 as corresponding to the opening part 43C. The concave part 41C extends in an almost perpendicular direction against a main surface of the silicon substrate 41. The silicon dioxide film 43 is used as a hard mask and the etching is selectively done in the silicon substrate 41. During the etching, the concave part 41C expands to a side direction, so that the concave part 41C has a bigger diameter than the diameter of the opening part 43C. Then, a space 45A is formed in the application insulating film 45 filling in the concave part 41C and extends in an almost perpendicular direction against a main surface of the silicon substrate 41.

Furthermore, as described at page 12, lines 29-32, the piercing electrode 46A is formed such that it is surrounded by the application insulating film sleeve 45B in the concave part 41C. That is, the insulating film sleeve 45b lies only between the piercing electrode 46A and an inside wall of the piercing hole 41C in the semiconductor substrate 41. The insulating film sleeve 45b does not exist on an inside wall of the opening part 43C of the silicon dioxide film 43 (that is the insulating film functioning as the etching mask).

Ochiai et al does not disclose the insulating film as an etching mask whereby the piercing hole is formed. Ochiai et al merely discloses an insulator layer 45 for separation between elements and a middle insulation layer 47. See an English translation of [0020] and [0022]. The insulator layer 45 and the middle insulation layer 47 of Ochiai et al does not function as the etching mask for a breakthrough 39.

Thus, Ochiai et al does not teach or suggest ““wherein the piercing hole is formed by using the insulating film as an etching mask,” “an insulating film sleeve lies only between the piercing electrode and an inside wall of the piercing hole in the semiconductor substrate,” as recited in amended claims 1 and 5.

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For at least these reasons, claims 1 and 5, as amended, patentably distinguish over Ochiai and Hsu. Claim 4, depending from claim 1, and claim 8, depending from claim 5, also patentably distinguish over Ochiai and Hsu for at least the same reasons.

Thus, the 35 U.S.C. §102(b) rejection should be withdrawn.

Claims 2, 3, 6 and 7 were rejected under 35 U.S.C. §103(a) as being obvious over Ochiai et al and further in view of Hsu (U.S. Patent No. 5,841,133).

Applicant respectfully traverses this rejection.

As discussed above, Ochiai et al does not teach or suggest ““wherein the piercing hole is formed by using the insulating film as an etching mask,” “an insulating film sleeve lies only between the piercing electrode and an inside wall of the piercing hole in the semiconductor substrate,” as recited in amended claims 1 and 5.

Hsu was cited for allegedly disclosing an insulating film comprised of an organic polymer. Such a disclosure, however, does not remedy the deficiencies of Ochiai et al discussed above.

For at least these reasons, claims 2, 3, depending from claim 1, and claims 6 and 7, depending from claim 5, also patentably distinguish over Ochiai and Hsu.

Thus, the 35 U.S.C. §103(a) rejection should be withdrawn.

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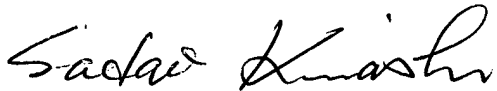
In view of the aforementioned amendments and accompanying remarks, claims, as amended, are in condition for allowance, which action, at an early date, is requested.

If, for any reason, it is felt that this application is not now in condition for allowance, the Examiner is requested to contact Applicant's undersigned attorney at the telephone number indicated below to arrange for an interview to expedite the disposition of this case.

In the event that this paper is not timely filed, Applicant respectfully petitions for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 01-2340.

Respectfully submitted,

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